

KATHMANDU UNIVERSITY  
End Semester Examination  
July/August, 2024

Marks Scored:

Level : B.ARCH

Year : III

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : EEG 331

Semester : II

F. M. : 10

Date : 12 AUG 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

**Choose and encircle in the most appropriate option from each set of choices**

1. A mercury vapour lamp for street light gives \_\_\_\_\_ light  
a. White                      b. Pink                      c. Yellow                      d. Greenish blue
2. The \_\_\_\_\_ bulb consumes less power for light with same intensity  
a. Incandescent                      b. Compact Fluorescent Light (CFL)  
c. Light Emitting Diode (LED)                      d. Fluorescent Tube
3. One candle power of source light emits \_\_\_\_\_  
a. One lumen per steradian                      b. One lumen per radian  
c. One lumen per watt                      d. One lumen per meter
4. The minimum cross section area of conductors used for light wiring in Nepal as per the Nepal Building Code 207 is  
a. 2.5 mm<sup>2</sup>                      b. 1.5 mm<sup>2</sup>                      c. 4 mm<sup>2</sup>                      d. 6 mm<sup>2</sup>
5. The ratio of luminous flux emitted by a lamp to the power consumed by the lamp is  
a. Lux                      b. Luminous efficiency  
c. Illuminance                      d. Color rendering index
6. A 250 Volt lamp has a total flux of 3000 lumens and takes current of 0.8 Amperes from 250 Volt mains. Its luminous efficiency is  
a. 12 lumens per watt                      b. 9.6 lumens per watt  
c. 15 lumens per watt                      d. 240 lumens per watt
7. \_\_\_\_\_ distribution system is preferred for multi storey buildings  
a. Tree system                      b. Ring main system  
c. Distribution board system                      d. Rig main and distribution board system
8. The main function of a fuse is to  
a. Protect the line                      b. Open the circuit  
c. Protect the appliance                      d. Prevent excessive current
9. A short circuit is identified by  
a. No current flow                      b. Heavy current flow  
c. A drop in the voltage                      d. A rise in the voltage

10. A switchgear is used for
  - a. Interrupting an electrical circuit
  - b. Switching an electrical circuit
  - c. Switching and controlling an electrical circuit
  - d. Switching, controlling, and protecting the electrical circuit
  
11. The advantage of a neutral earthing is
  - a. Freedom from persistence arcing grounds
  - b. Over voltages due to lightning can be discharged to ground
  - c. Simplified design earth fault protection
  - d. All of the above
  
12. Conventional current describes
  - a. Direction of positive charge flow
  - b. Direction of negative charge flow
  - c. Describes the direction of positive and negative charge flow
  - d. None of the above
  
13. The decrease in electrical potential between the two places in an electrical circuit or component is referred to as
 

a. Electric current drip	b. Voltage drop
c. Resistance sinking	d. Current dribbling
  
14. Copper conductors are preferred over aluminum for transmission and distribution of electrical power as
  - a. They offer no opposition to the flow of current
  - b. They offer high opposition to the flow of current
  - c. They offer a very little opposition to the flow of current
  - d. They have a very little dribbling power
  
15. Miniature circuit breaker (MCB) is a device that provides protection to the wiring installation and equipments against
 

a. Over overvoltage	b. Short circuit
c. Pilferage of electricity	d. Lightning arc
  
16. Energy meter for a single phase electricity distribution system has \_\_\_\_\_ terminals
 

a. Two	b. Four	c. Six	d. Eight
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17. The term "overload" in an electrical circuit refers as
  - a. Using energy efficient applicanes
  - b. Overcharging a battery
  - c. Insulating electrical wires
  - d. Using too many electrical devices simultaneously
  
18. A desired illumination level on the working plane depends upon
  - a. Age group observers and whether the object is stationary or moving.
  - b. Size of the object to be seen and its distance from the observers.
  - c. Whether the object is to be seen for longer duration or shorter duration of time.
  - d. All of the above.

19. If two switches are connected in series to a lamp/load, then
  - a. Any one switch need to be switched ON to energize the load
  - b. Both the switches need to be switched ON to energize the load
  - c. Only switch 1 need to be switched ON to energize the load
  - d. Only switch 2 need to be switched ON to energize the load
  
20. The service mains connects
  - a. Distributor and consumer terminals
  - b. Distributor and transformer
  - c. Distributor and relay system
  - d. Transformer and earth



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Level : B.ARCH  
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Time : 2 hrs. 30mins.

12 AUG 2024

Course : EEEG 331  
Semester : II  
F. M. : 40

SECTION "B"

[5 Q. × 8 = 40 marks]

Attempt ANY FIVE questions. Assume any suitable data if required.

1.
  - a. What does coefficient of utilization represents in a lighting system. State five factors the affects the coefficient of utilization. [3]
  - b. Why is it necessary to include the light loss factor in the calculation of the required number of luminaires? Differentiate between recoverable and unrecoverable light loss factors. [3]
  - c. List out six classification of luminaires according to their distribution pattern. [2]
2.
  - a. The main circuit wire in a house is required to carry a current of 45 Amperes when connected to a single phase ac supply. Determine the size of the wire if the length of the circuit is 40 meters. Assume the declared voltage is 230 Volts. [3]
  - b. What is a building service? Explain the significance of electrical installation in building services. [3]
  - c. In a room 12 \* 20 ft, the total light incident on the horizontal workplane is 10, 000 lumen. Calculate the illuminance on the working plane in lux.  
Two light sources having a uniform intensity of 1000 candela (cd) are mounted 7m high and 20 m apart. Determine the illumination at a distance below the lamps and midway between the lamps. [2]
3.
  - a. What is the function of an earth wire? Why is it necessary to earth metallic appliances? Explain the plate earthing method implemented with a suitable diagram. [3]
  - b. Elaborate the terms luminous flux, luminous intensity, illuminance, luminance, illuminating object, luminous exitance. Explain about the significane of an intensity distribution curve. [2]
  - c. Explain the difference between overload and short circuit. Why can an overload be left on the system for a relatively longer period of time. Explain the difference between a miniature circuit breaker (MCB) and moulded case circuit breaker (MCCB). [3]

P.T.O.

4.

- a. Explain the types of distribution system based on the connections. [2]
- b. A residential block has been supplied with a single phase supply and has miniature circuit breaker (MCB) rating of 32 Amperes approved from Nepal Electricity Authority (NEA). The rating of the appliance and the time of consumptions for two months has been provided in **Table 1** The Electricity Tariff and the monthly billing methods domestic consumers, from Nepal Electricity Authority (NEA) has been provided in **Table 2**.
- Calculate the total energy consumption in kilowatt hour (kWhr) for the month of July and August.
  - Determine the total amount of bill issued by NEA in Nrs/kWhr for the month of July and August.

[4]

*Table 1. Equipment rating and consumption for two months for question 2 (a)*

S.N	Appliance	Power rating (Watts)	Quantity	Hour of use (July)	Hour of use (August)
1	LED lamp	15	10	12	240
2	Television	100	1	6	60
3	Refrigerator	650	1	12	360
4	Microwave Oven	500	1	5	30
5	Toaster	350	1	6	30
6	Air conditioning	1000	1	6	300
7	Water Pump	750	1	10	150

*Table 2. Energy charge for question 2 (a)*

kWh (monthly)	30 Ampere	
	Monthly minimum charge (Nrs)	Energy Charge (Nrs/kWh)
0-20	75	5
21-30	100	6.5
31-50	100	8
51-100	125	9.5
101-250	150	9.5
Above 251	200	11

- c. Illustrate the electrical supply system with proper indications of the single phase distribution system from grid utility to residential consumer.

[2]

5.

a. An industrial area to be lighted is as follows:

Type of building: Industrial

Area/activity: assembly, moderately difficult

Average age of workers: 35 years

Demand for speed and accuracy: Important

Task background reflectance: 41%

Size of room: 60ft x80 ft, 25 ft ceiling

Height of work plane=4 m

Reflectance factors: Ceiling 70%, Walls 50%, Floor 20%

Ballast factor= 0.95

Luminaire type: 3

Luminaire mounting: suspended 5.5 ft

Lamps: 1500 mA, 96 in., T-12,CW, rapid-start fluorescent

Atmosphere: Medium

Interval between cleaning: 30 months

Calculate the theoretical number of luminaires required to light the industrial area and unit power density.

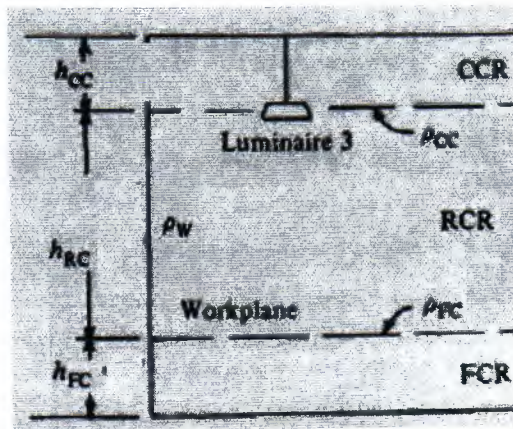


Figure 1. Question 3

6.

- a. The layout plan for a two floor resident is shown in **Figure 2**. Prepare a light layout plan indicating switch location and power layout plan. [4]

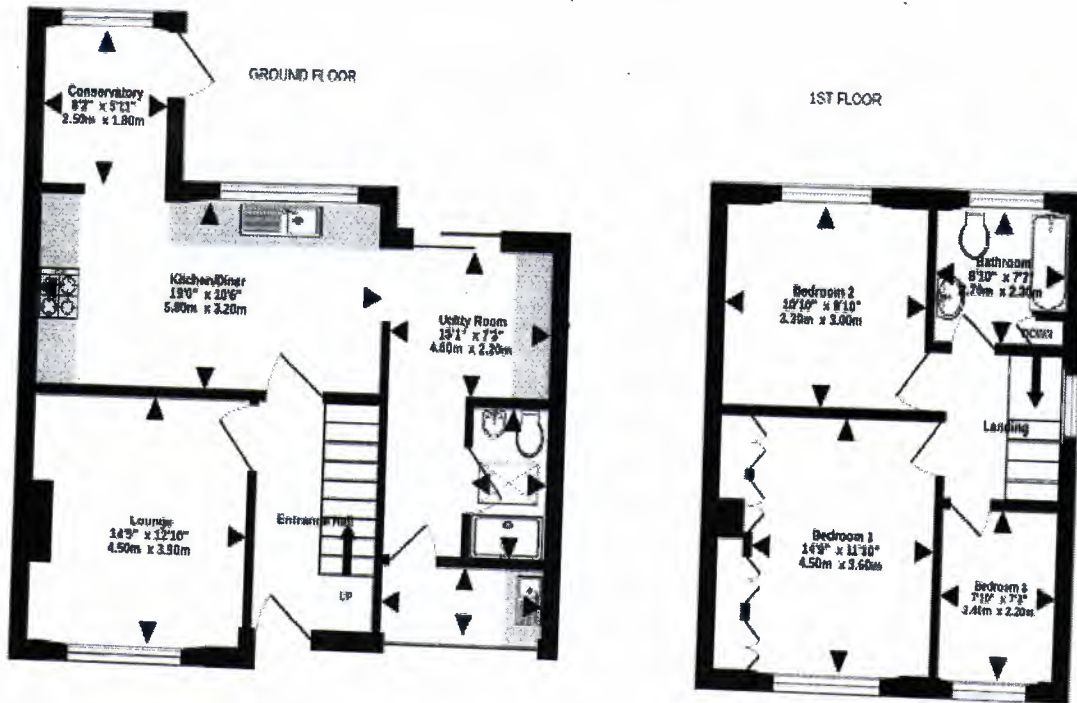


Figure 2 Resident layout plan for question 6a.

- b. Design a solar photovoltaic system to be supplied as a backup supply for a office room based on the data as provided in Table 3:

Table 3. Appliances ratings for question 6b

S.N	Name of appliance	Watts	Number	No. of hours in use
1	Computer	200	5	7
2	Compact Fluorescent Lamp	18	5	8
4	Fan	100	2	7

Assume inverter efficiency =95% and battery efficiency of 98%. Consider equivalent solar radiation of 5 hours per day. Choose 75 Watt peak, ( $W_p$ ) module and battery system voltage of 12 Volt.

[4]